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Symbol	Name	Synonyms	Or
 ARRB1	arrestin, beta 1	ARB1, ARR1, Arrestin, beta 1, Beta-arrestin-1	Hc
UniProt	P49407, Q2PP20, O75630		
OMIM	107940		
NCBI Gene	408		
NCBI RefSeq	NP_064647, more than 1,500 organisms. 80,000 genes. 12 million sentences NP_004032		...always up-to-date
NCBI RefSeq	NM_004041, NM_020251		
NCBI UniGene	408		
NCBI Accession	AAA35559, BU594296		

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These results suggest that **beta-arrestin** was recruited in response to receptor **phosphorylation** by different GRKs with distinct functional potentials. [2005]

Low surface deposition and **endocytosis** are dependent on constitutive C-terminal **phosphorylation**, suggesting requirement for **beta-arrestin** binding in receptor internalization. [2004]

In contrast, corresponding to its inability to cause mu OR internalization, morphine is unable to either elicit mu OR **phosphorylation** or stimulate **beta-arrestin** translocation. [1998]

While both etorphine and morphine effectively activate the delta OR, only etorphine triggers robust delta OR **phosphorylation** followed by **plasma membrane translocation** of **beta-arrestin** and receptor internalization.

Heterologous activation of protein kinase C stimulates **phosphorylation** of delta-opioid receptor at **serine** 344, resulting in **beta-arrestin**- and clathrin-mediated receptor internalization. [2001]

Receptor mutants that lack any two **phosphorylation** sites retained their ability to recruit endogenous **beta-arrestin** from **cell membrane** and were normally sequestered, whereas **alanine** mutation of any three C-terminal **serine** residues abolished both **beta-arrestin** binding and rapid agonist-induced internalization. [2002]

Determinants in the receptor's core (Asn-289 and Lys-382) appear to regulate internalization of the receptor/beta arrestin complex toward early endocytic **endosomes** during the initial step of **endocytosis**. [2002]

After **angiotensin** II stimulation, both wild-type and **beta-arrestin** mutants translocated to the **cell membrane**, recruitment was weaker for mutants of the hydrophobic face of helix I. [2005]

It also blocked **beta arrestin** translocation and receptor downregulation induced by formyl-Nle-Leu-Phe. [2005]

These differences in mechanism of action are reflected in the **kinetics** of airway **smooth muscle** relaxation and bronchodilation in patients with asthma. beta-Adrenoceptor desensitization associated with beta2-agonist activation is a consequence of **phosphorylation** by beta-ARK and uncoupling of the receptor from Gs following **beta-arrestin** of internalization and recycling of the receptor through processes of sequestration and resensitization and downregulated by an effect on receptor gene expression. [1998]

To address this question, we investigated the ability of different muscarinic receptor dimers to recruit **beta-arrestin** using both **co-immunoprecipitation** and **fluorescence microscopy** in **COS-7 cells**. [2005]

By **confocal microscopy**, we observed **beta-arrestin** 1 and 2, translocated to the **plasma membrane** and colocalized with D2L and D2S receptors upon stimulation with **dopamine**, and this was followed by the **translocation** of receptor to **endocytic vesicles**. [2004]

**Bioluminescence resonance energy transfer** analysis revealed that both wild-type and **beta-arrestin** mutant had a capacity to interact with the AT(1)R, although the interaction with the mutants was less stable. [2005]

For class B receptors (e.g. V2 **vasopressin** receptors), which recycle slowly, **beta-arrestin** internalizes with the receptor.

into endosomes. [2003]

Nicotine induces cell proliferation by beta-arrestin☆-mediated activation of Src and Rb-Raf-1 pathways. [2006] Although still capable of activating phospholipase C, this receptor loses almost completely the ability to recruit beta-arrestin-1 ☆ following carbachol stimulation in COS-7 cells. [2005]

Desensitization to low concentrations of isoproterenol (previously shown to be essentially protein kinase A-mediated not receptor-specific, i.e. heterologous) was not affected by overexpression of either beta ARK or beta-arrestin☆.

Several GPCRs internalize as a stable complex with beta-arrestin☆ and the stability of this complex appears to at least in part, whether the receptors are dephosphorylated in early endosomes and recycled back to the cell surface as fully functional receptors, retained in early endosomes or targeted for degradation in lysosomes. [2003]

Role of beta-arrestin 1☆ in the metastatic progression of colorectal cancer. [2006]

Furthermore, our data implicate a functional role for beta-arrestin 1☆ as a mediator of cellular migration and metastasis. [2006]

To our knowledge this is the first study demonstrating a defined molecular role of beta-arrestin [?]☆ with direct relevance to cell growth and cancer. [2005]

Using in vitro binding assays, we have identified two glutamate residues (Glu-849 and Glu-902) in beta(2)-adaptoin important in beta-arrestin☆ binding. [2002]

Using receptor mutagenesis, we demonstrate that the ability of beta-arrestin☆ to remain associated with these receptors is mediated by specific clusters of serine and threonine residues located in the receptor carboxyl-terminal tail. [2002]

High levels of beta-arrestin-1☆ mRNA and immunoreactivity were found in peripheral blood leukocytes. [1993]

Using two cell types, human endothelial cells and smooth muscle cells, we found that 6-8-h treatments with the inducing agents cholera toxin, forskolin, iloprost, and isoproterenol raised beta-arrestin-1☆ mRNA by 2-4-fold.

The mean beta-arrestin 1☆ expression was unchanged in the cytosol of TTNs, in membranes and cytosol of heart decreased in the membranes of TTNs compared to their surrounding tissue. [2000]

These data suggest that beta-arrestin☆ binding, which terminates receptor-G protein coupling, also initiates a second wave of signal transduction in which the "desensitized" receptor functions as a critical structural component of a signaling complex. [1999]

Regulation of tyrosine kinase activation and granule release through beta-arrestin☆ by CXCR1. [2000]

ICI118551 and propranolol also promoted beta-arrestin☆ recruitment to the receptor. [2003]

Constitutive protease-activated receptor-2-mediated migration of MDA MB-231 breast cancer cells requires both beta-arrestin-1☆ and -2. [2004]

In contrast, beta-arrestin☆ mutants displayed enhanced activity at desensitizing the serotonin 5-hydroxytryptamine receptor. [2004]

The fusion protein of beta-arrestin 1☆ with glutathione S-transferase inhibits the beta(1)- and beta(2)AR-stimulated adenylyl cyclase activities, although inhibition of the beta(1)AR-stimulated activity requires a higher concentration of the fusion protein than that of the beta(2)AR-stimulated activity. [2000]

Regulation of muscarinic acetylcholine receptor sequestration and function by beta-arrestin☆. [1999]

In conclusion, agonist-activated hPTH1-Rc internalization involves beta-arrestin☆ mobilization and targeting to coated vesicles. [1999]

Two alternatively spliced isoforms of human beta-arrestin-1☆, differing only in the presence or absence of 24 base pairs/8 amino acids within the sequence, were identified and called beta-arrestin-1A and beta-arrestin-1B, respectively. [1993]

Molecular analysis of human beta-arrestin-1☆: cloning, tissue distribution, and regulation of expression. Identifies two isoforms generated by alternative splicing. [1993]

The reduction in beta-arrestin-1☆ levels was significantly correlated with the severity of depressive symptoms.

The findings in human subjects support the implication of beta-arrestin-1☆ in the pathophysiology of mood disorders. [2004]

Mononuclear leukocytes of patients with depression showed significantly reduced immunoreactive quantities of beta-arrestin-1☆. [2004]

RESULTS: Beta-arrestin-1☆ levels were significantly elevated by all three antidepressants in rat cortex and

hippocampus, while in the striatum no alterations could be detected. [2004]

METHOD: Beta-arrestin-1  $\star$  measurements were carried out in cortical, hippocampal, and striatal brain regions chronically intragastrically treated with either imipramine, desipramine, or fluvoxamine. [2004]

This beta-arrestin  $\star$ -mediated regulation of transcription appears to play important roles in cell growth, apoptosis modulation of immune functions. [2007]

Among all cell lines, sequestration correlated best with the product of betaARK and beta-arrestin  $\star$  expression.

Both beta ARK and beta-arrestin  $\star$  are members of multigene families. [1994]

The agonist-stimulated differential sorting of the mGlu(1) receptor and beta-arrestin [?]  $\star$  as well as the activative kinases by mGlu(1) agonist was confirmed in cultured cerebellar Purkinje cells. [2003]

Utilizing a low stringency hybridization technique to screen a rat brain cDNA library, we have now isolated cDNA representing two distinct beta-arrestin [?]  $\star$ -like genes. [1992]

Addition of recombinant purified beta-arrestin-1 mimicked human chorionic gonadotrophin to promote desensitization of human chorionic gonadotrophin-stimulated AC activity, in the presence of the ATP phosphorylation antagonist imidodiphosphate, with an ED50 of approximately 0.1 nM. [1999]

The localization of the alpha(1B)-ARs and AT(1A)Rs with arginine substitutions can be restored to the plasma membrane by either using selective antagonists or preventing the endocytosis of the beta-arrestin [?]-receptor complexes.

Internalization of the ligand did not occur in beta-arrestin [?]-deficient cells; was blocked or reversed by another ligand, phenotolamine, indicating it to reflect binding to the orthosteric recognition site; and was prevented by blocking clathrin-mediated endocytosis. [2005]

Increased levels of an 87-kDa protein reactive with glycoprotein hormone R-reactive antibody, consistent with the R, coimmunoprecipitated with follicular membrane beta-arrestin-1 in response to LH/CGr activation compared with unactivated R. [1999]

While AT(1A) receptor internalization could be inhibited by a dominant-negative beta-arrestin 1 mutant (beta arr1 418), treatment with hyperosmotic sucrose to inhibit internalization did not abrogate the differences in arrestin activation observed between the wild-type and mutant receptors, indicating that arrestin binding precedes, and is not dependent on receptor internalization. [2001]

Of particular note are the recent findings regarding recruitment of cyclic nucleotide phosphodiesterase to beta-arrestin transfected HEK293 cells and in native cardiac myocytes. [2003]

Alteration of sites of acylation reduced internalization and prevented interactions with beta-arrestin [?] 1-GFP. [2004]

In contrast, no change in the subcellular distribution of adenylate cyclase or beta-arrestin 1 and 2 was observed.

The identification of the ubiquitin-proteasome pathway and beta-arrestin as molecular targets of neurotoxicity is likely to provide novel therapeutic strategies both for the treatment of drug addiction and the treatment of neurodegenerative disorders. [2006]

Our choice of screening platform was the Transfluor beta-arrestin-green fluorescent protein translocation assay. Full-length human orphan GPCRs were stably expressed in a U-2 OS cell background. [2006]

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1: [Vaughan DJ, Millman EE, Godines V, Friedman J, Tran TM, Dai W, Knoll BJ, Clark RB, Moore RH.](#) Related Articles, Links

Role of the G protein-coupled receptor kinase site serine cluster in beta2-adrenergic receptor internalization, desensitization, and beta-arrestin translocation.

J Biol Chem. 2006 Mar 17;281(11):7684-92. Epub 2006 Jan 3.

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The novel ATP-binding cassette protein ARB1 is a shuttling factor that stimulates 40S and 60S ribosome biogenesis.

Mol Cell Biol. 2005 Nov;25(22):9859-73.

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beta-Arrestin 1 and Galphaq/11 coordinately activate RhoA and stress fiber formation following receptor stimulation.

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- 10: [Braun L, Christophe T, Boulay F.](#) Related Articles, Links

-  Phosphorylation of key serine residues is required for internalization of the complement 5a (C5a) anaphylatoxin receptor via a beta-arrestin, dynamin, and clathrin-dependent pathway.  
J Biol Chem. 2003 Feb 7;278(6):4277-85. Epub 2002 Dec 2.  
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- 11: [Hanyaloglu AC, Seeber RM, Kohout TA, Lefkowitz RJ, Eidne KA.](#) Related Articles, Links

-  Homo- and hetero-oligomerization of thyrotropin-releasing hormone (TRH) receptor subtypes. Differential regulation of beta-arrestins 1 and 2.  
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- 12: [Chalothorn D, McCune DF, Edelmann SE, Garcia-Cazarin ML, Tsujimoto G, Piascik MT.](#) Related Articles, Links

-  Differences in the cellular localization and agonist-mediated internalization properties of the alpha(1)-adrenoceptor subtypes.  
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- 14: [Evans NA, Groarke DA, Warrack J, Greenwood CJ, Dodgson K, Milligan G, Wilson S.](#) Related Articles, Links

-  Visualizing differences in ligand-induced beta-arrestin-GFP interactions and trafficking between three recently characterized G protein-coupled receptors.  
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 Analysis of the C-terminal tail of the rat thyrotropin-releasing hormone receptor-1 in interactions and cointernalization with beta-arrestin 1-green fluorescent protein.  
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Symbol	Name	Synonyms	Or
 ARRB2	arrestin, beta 2	ARB2, ARR2, Arrestin, beta 2, Beta-arrestin-2, DKFZp686L0365	Hc
UniProt	P32121, Q59EM5, Q6ICT3		
OMIM	107941		
NCBI Gene	409		
NCBI RefSeq	NP_945355, more than 1,500 organisms. 80,000 genes. 12 million sentences NP_004304		...always up-to-date
NCBI RefSeq	NM_004313, NM_199004		
NCBI UniGene	409		
NCBI Accession	CR749218, CR591682		

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Moreover, stimulation of the angiotensin II type 1A receptor activated JNK3 and triggered the colocalization of beta-arrestin 2 and active JNK3 to intracellular vesicles. [2000]

PTH-related protein analogs modified at position 1 induced selective stabilization of the active G protein-coupled receptor, resulting in lack of beta-arrestin-2 recruitment to the cell membrane, sustained cAMP signaling, absence of ligand-receptor complex internalization. [2002]

Angiotensin II type 1 receptors (AT1-Rs) are coupled to the contraction-mediating RhoA/Rho-kinase pathway and can be desensitized by phosphorylation through G-protein-coupled receptor [?] kinases (GRKs) and binding of beta-arrestin-2 [?]. [2007]

These data suggest that beta-arrestin 2 can mediate chemotaxis through mechanisms which may be G-protein independent (Ang II receptors) or -dependent (LPA receptors). [2005]

Dishevelled 2 [?] recruits beta-arrestin 2 to mediate Wnt5A-stimulated endocytosis of Frizzled 4. [2003]

Endocytosis of Frizzled 4 (Fz4) in human embryonic kidney 293 cells was dependent on added Wnt5A protein and was accomplished by the multifunctional adaptor protein beta-arrestin 2 (betaarr2), which was recruited to Fz4 binding to phosphorylated Dvl2. [2003]

Beta-arrestin 2 mediates endocytosis of type III TGF-beta [?] receptor and down-regulation of its signaling.

We identified c-Jun amino-terminal kinase 3 (JNK3) as a binding partner of beta-arrestin 2 using a yeast two-hybrid screen and by coimmunoprecipitation from mouse brain extracts or cotransfected COS-7 cells. [2000]

The role of beta-arrestin 2 was further confirmed by showing that transfection of beta-arrestin 2 in these knockout cells restored ICI118551 promoted ERK1/2 activation. [2003]

Further experiments revealed that overexpression of beta-arrestin 2 enhanced the p53[?]-mediated apoptosis while suppression of endogenous beta-arrestin 2 expression by RNA interference technology considerably attenuated the p53[?]-mediated apoptosis. [2003]

The increased beta-arrestin 2 expression in TTNs and the desensitization of the TSH receptor by beta-arrestin 2 *in vitro* suggest that the beta-arrestin 2 expression is cAMP dependent and that beta-arrestin 2 is very likely desensitizing the constitutively activated TSH receptor in toxic thyroid nodules. [2000]

Independent beta-arrestin 2 and G protein-mediated pathways for angiotensin II activation of extracellular signal-regulated kinases 1 and 2. [2003]

Activation of GPCRs led to formation of a ternary complex of Mdm2, beta-arrestin 2, and GPCRs and thus recruited Mdm2 to GPCRs at plasma membrane. [2003]

Beta-arrestin 2-dependent angiotensin II type 1A receptor-mediated pathway of chemotaxis. [2005]

In parallel, stimulation of the wild-type angiotensin type 1A receptor with Ang II robustly stimulates ERK1 [?]/ with approximately 60% of the response blocked by the PKC inhibitor (G protein dependent) and the rest of the r blocked by depletion of cellular beta-arrestin 2 by small interfering RNA (beta-arrestin dependent). [2003]

We show in real time and in live human embryonic kidney (HEK-293) cells that a beta-arrestin-2-green fluores protein conjugate internalizes into endocytic vesicles with agonist-activated neurotensin-1 receptor, oxytocin receptor, angiotensin II type 1A receptor, and substance P receptor. [2001]

This desensitization process coincides with a redistribution of GRK2 from the cytosol to the plasma membrane followed by a robust redistribution of beta-arrestin 2 and a profound change in cell morphology that occurs after SPR stimulation. [1999]

We find that two molecules interact with mammalian Smo in an activation-dependent manner: G protein-coupled kinase 2 (GRK2) leads to phosphorylation of Smo, and beta-arrestin 2 fused to green fluorescent protein interacts with Smo. [2004]

The glucagon-like peptide-2 receptor C terminus modulates beta-arrestin-2 association but is dispensable for ligand-induced desensitization, endocytosis, and G-protein-dependent effector activation. [2005]

This study has focused on enhancing the signal generated from the interaction between a G-protein-coupled receptor (GPCR [?]) and beta-arrestin 2 (beta-arr2), measured by the bioluminescence resonance energy transfer (BRET) technology. [2004]

MOR363D underwent slower internalization as reflected in the attenuation of membrane translocation of beta-arrestin 2 when compared with wild type MOR, but the level of receptor being internalized was similar to that of wild type MOR in the absence of etorphine treatment. [2003]

Regulation of GRK 2 and 6, beta-arrestin-2 and associated proteins in the prefrontal cortex of drug-free and antidepressant drug-treated subjects with major depression. [2003]

In contrast, expression of beta-arrestin 1 and beta-arrestin 2 by osteoblastic cells varied between cell line and chromosome mapping of the human arrestin (SAG), beta-arrestin 2 (ARRB2), and beta-adrenergic receptor kinase 2 (ADRBK2) genes. [1994]

Conversely, suppression of beta-arrestin 1, but not beta-arrestin 2, expression by using RNA interference resulted in a fold increase in tumor necrosis factor-stimulated NF-kappaB activity as measured by NF-kappaB mobility-shift analysis. [2004]

Surprisingly, although the truncated mutant receptors failed to interact with beta-arrestin-2, they underwent both desensitization and subsequent resensitization with kinetics similar to that observed with the wild-type GLP-2R.

Co-expression of PAR1 [?] with beta-arrestin 1 (betaarr1) in COS-7 cells resulted in a marked inhibition of [?] signaling, whereas beta-arrestin 2 (betaarr2) was essentially inactive. [2004]

Of all the retinoid receptors, the RAR beta2 subtype showed the strongest sensitivity to beta-arrestin 2 activation. Moreover, an agonist-mediated translocation of wild-type beta2AR and endogenous beta-arrestin 2 to endosomes prepared from CHO fibroblasts was observed. [1997]

In summary, contrary to data obtained for the beta2AR, the constitutive activation of the TSHR does not influence desensitization and time course for internalization of the receptor, and in agreement with findings for the FSH and LH receptors, these results characterize the TSH receptor as a member of the class A of G protein-coupled receptors that have a higher affinity to beta-arrestin 2 than beta-arrestin 1 and do not colocalize with beta-arrestins in endosomes. [2006]

In the present study, we demonstrated that repeated s.c. treatment with etorphine, but not morphine, produced a marked increase in protein levels of G protein-coupled receptor kinase 2, dynamitin [?], beta-arrestin 2 and phosphorylated-conventional protein kinase C in membranes of the mouse spinal cord, suggesting that the etorphine induced mu-opioid receptor desensitization may result from G protein-coupled receptor kinase 2/dynamitin/t beta-arrestin2-dependent phosphorylation of mu-opioid receptors. [2006]

Gene-wide tests, adjusted for the number of SNPs analysed in each gene, identified associations with TPH2, ASY, SYP, DAT1, ADRB2, HES1, MAOA and PNMT. [2006]

Overexpression of either beta-arrestin 1 or beta-arrestin 2 led to marked inhibition of NF-kappaB activity, as measured by reporter gene activity. [2004]

In the present study, we have investigated the expression of the individual isoforms of beta-arrestin and of beta-ARK-1 and beta-ARK-2 in failing and control human hearts. mRNAs for all four proteins, beta-arrestin-1, beta-arrestin-2, beta-ARK-1, and beta-ARK-2, were identified in human heart. [1994]

Our data suggest that in cirrhosis-induced vasodilation, the AT1-R is desensitized by GRK-2 [?] and beta-2 [?] and that changed patterns of phosphorylated Ca(2+) sensitizing proteins decrease Ca(2+) sensitivity. [2007] Cell surface distribution and agonist-promoted internalization of receptors and recruitment of beta-arrestin 2 w unaffected by the loss of 187 glycosylation. [2004]

However, upon coexpression of arrestin-2 (beta-arrestin-1) or arrestin-3 (beta-arrestin-2), internalization of alpha2b AR was dramatically enhanced and redistribution of receptors to clathrin coated vesicles and endosomes observed. [1999]

However, in the same cell lines under the same conditions, overexpression of beta-adrenergic receptor kinase beta-arrestin 2 accelerated the rate of DPDPE- but not DAMGO-induced receptor desensitization. [1999]

Here, we report that beta-arrestin 2 stimulates the transcriptional activation of the retinoid RAR and RXR receptors. [2006]

Using Xenopus laevis oocytes coexpressing mammalian mu-opioid receptors (MORs), beta-adrenergic receptor 2 (beta-ARK2) [also called G protein-coupled receptor kinase (GRK3)], and beta-arrestin 2 (beta-ar compared the rates of beta-ARK2 (GRK3)- and beta-arr 2-mediated homologous receptor desensitization prod treatment with opioid agonists of different efficacies. [1998]

In the presence of C2 [?] alone, CRIT associates with the adapter protein, beta-arrestin-2, and whether in ass with C2 [?] or not, then appears in the perinuclear region, but does not appear to be translocated into the nucleus

Characterization of isoprenaline- and salmeterol-stimulated interactions between beta2-adrenoceptors and beta-2 using beta-galactosidase complementation in C2C12 cells. [2005]

Isoprenaline, noradrenaline, and adrenaline (-log EC(50) = 5.9, 5.5, and 5.7, respectively) stimulated an associ between the beta(2)-adrenoceptor and beta-arrestin 2 at much higher concentrations than required for activati cAMP accumulation (-log EC(50) = 7.6, 6.3, and 7.7, respectively). [2005]

The results indicate that opiate addiction in humans (tolerant state) is associated with down-regulation of brain opioid receptors and regulatory GRK 2/6 and beta-arrestin-2 proteins. [2004]

G protein-coupled receptor kinases, beta-arrestin-2 and associated regulatory proteins in the human brain: postmortem changes, effect of age and subcellular distribution. [2002]

Although beta-arrestin 1 and beta-arrestin 2 are important for these effects induced by opioids with high in efficacy such as etorphine and fentanyl, morphine tolerance may be mediated mainly via beta-arrestin 2. [2002]

4. The results suggest that VOL induces an increase in the expression of lymphocyte beta2-adrenoceptor-sp GRK and beta-arrestin 2 in association with an attenuation in beta2-adrenoceptor levels. [2002]

Studies in mice have shown that beta-arrestin-2 [?] plays an important role in the development of morphine-tolerance, constipation, and respiratory depression. [2007]

Periaqueductal gray (PAG) is a potential structure where morphine produces its antinociception, but it is unclear beta-arrestin 2 plays its regulatory effect on morphine at PAG. [2006]

The genes for phosphatidylinositol transfer protein (PITPN), retinal guanylate cyclase (GUC2D), beta-arrestin 2 (ARRB2), pigment epithelium-derived factor (PEDF) and recoverin (RCV1) map to this region and are cand genes for retinal disease. [1996]

In contrast, B1Rs, which are inducible and constitutively active, constitutively internalize without agonist via a clatl dependent pathway, do not recruit beta-arrestin 2, bind G protein-coupled receptor sorting protein, and target lysosomes for degradation. [2007]

Cotransfection of M3 cells with the c-Myc-tagged hMC2R and beta-arrestin-2-green fluorescence protein alo sucrose treatment revealed that beta-arrestin-2-green fluorescence protein and c-Myc-hMC2R were redistr similar intracellular vesicles through a clathrin-dependent, but caveolae-independent, process. [2006]

Possible association of beta-arrestin 2 gene with methamphetamine use disorder, but not schizophrenia. [2007]

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